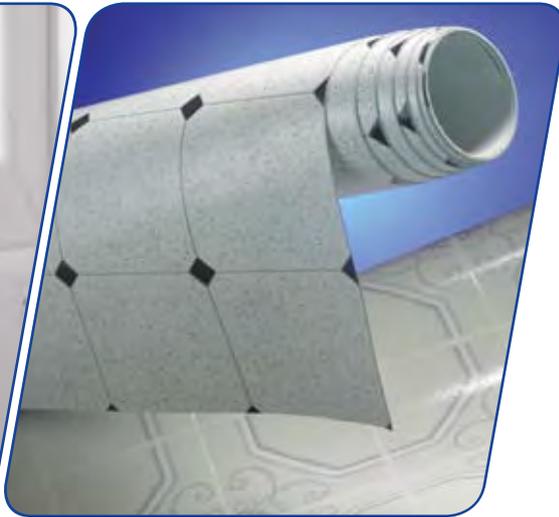
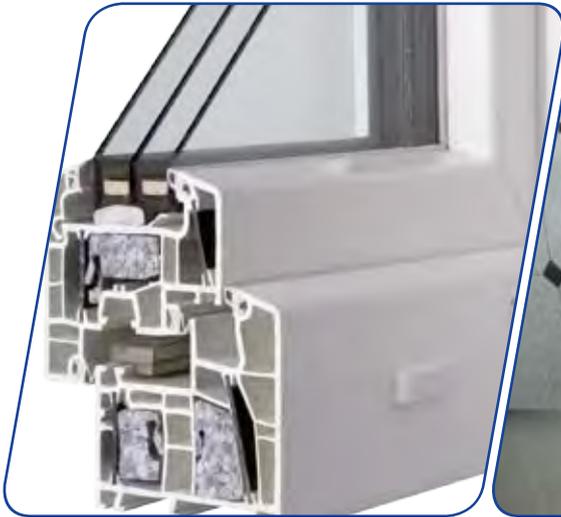
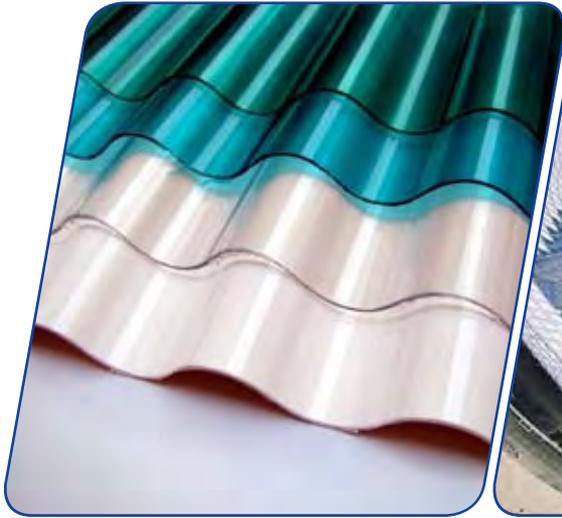


Market Study: Construction Plastics



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- **Have a look at the future**
Find out if new investments and technologies are worthwhile and how to gain access to future markets. We also show possible market scenarios
- **Recognize opportunities and risks**
Identify opportunities and risks on your target markets in time

This study is useful for:

- Manufacturers, processors, and distributors of plastic pipes as well as fittings, insulation materials and windows made of plastics, and floors, covers, facade components, coatings, films, sheets, sealants, doors, small parts and fixings
- Suppliers of raw materials and additives such as PVC, HDPE, PUR, EPS, XPS, LDPE, LLDPE, PP, PS, PC, ABS, PA, plasticizers, flame retardants, etc.
- Construction companies for building construction as well as civil engineering and infrastructure construction
- Associations and institutes, Executive board, technology and production, strategic planning, R&D, market research, marketing, sales and distribution, procurement

In this brochure you will find the following information:

- An introduction on page 3
- A summary of the table of contents on page 4
- Following this, there are example pages from the study
- Please use the form on the last page to easily order your copy or a free reading sample!

Plastics are safe, reliable, light, and cheap: these characteristics lead to a growing use in the construction industry. Furthermore, plastics are increasingly the first choice regarding the thermal insulation of buildings. Ceresana analyzed the market for plastics that are used in the construction industry. The different types of plastics are examined individually, especially PVC, HDPE, PUR, EPS, PP, PS, LDPE, LLDPE, PC, ABS, and PA. Demand for plastics for different products, such as pipes, insulation materials, and windows, is also analyzed, as well as the development in the segments new construction and renovation plus residential construction and non-residential construction. Ceresana expects global demand for plastics in the construction industry to increase to a 73 million tonnes in 2023.

Construction Industry with Different Dynamics in Different Countries

Demand for more energy efficient buildings increases worldwide. In the developed industrial nations in Europe, North America, and Asia, the focus is mainly on the energy efficient renovation of existing building structures; the new construction of buildings accounts for a comparatively slow dynamics. The situation is rather different in the emerging nations where tendencies are towards high activity in new constructions. A growing population in combination with a progressive urbanization leads to further increases in demand for new apartments. Besides Asia and the Middle East, Africa will also

be a hot spot for urbanization in the near future. Additionally, the average size of households is decreasing which causes an increase in average per capita living space. At present, the construction industry in some emerging countries like Brazil or India is affected negatively by corruption scandals, dissolution of the government, lack of regulations, or insecure investment conditions. However, an enormous future potential for example for plastic windows exists also in these countries since their market shares have been small until now and the advantages are becoming more and more evident.

Great Influence of State Subsidy Programs on the Market for Insulation Materials

Not only industrial countries but also emerging markets declared the reduction of greenhouse gas as political aim. Energy saving is a main starting point hereby. Since a major part of total energy consumption is registered by heating and cooling of living areas and commercial buildings, it becomes more and more important to install suitable systems to increase energy efficiency. The International Energy Agency assumes that to fulfill all aims of the climate conference of Paris until 2030, investments in the segments energy efficiency and climate-friendly technologies amounting to USD 13.5 trillion have to be made. Increasing numbers of support programs and legal regulations are passed which target the increase of energy efficiency of buildings. These programs have a high impact

on the dynamics of the respective insulation material markets. However, extent and consequences of the implementation of these programs can be very different from country to country. Thus, this study examines these aspects separately in each country profile.

Residential Construction as a Driver of Growth

Besides the segments new construction and renovation, this study also analyzes demand for plastics in regard to residential construction and non-residential construction. At a global level, residential construction is currently an important driving force for the demand for plastics. The ongoing trend of urbanization in large parts of the world is a decisive factor in this. Creating affordable living space in the cities is one of the most urgent aspects of many national development plans. However, the distribution among the construction segments in the regions and countries can vary considerably. Therefore, this distribution is given separately in each country profile.

PUR and EPS Profit from the Rising Demand for Insulation Materials

Especially PUR and EPS as well as PC account for high growth rates in the construction industry. Growth rates of the two first-mentioned plastics are caused by the dynamic development in insulation materials. PC is mainly used for transparent sheets in the construction industry which become more and more popular for designs with a high light incidence.

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- 1.3 Eastern Europe
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- ...
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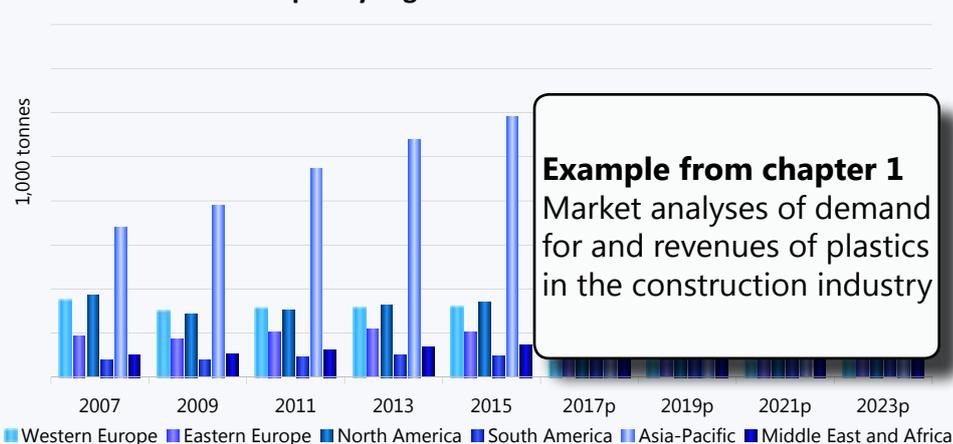
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Global demand for plastics in the building industry from 2007 bis 2023 - split by regions

Ceresana



1.2.2 Revenues

Global revenues generated with plastics in the construction industry rose from USD X billion* (EUR X billion) in 2007 to over USD X billion (EUR X billion) in 2015. This development translates into an average increase of X% per year (X% p.a. for values in EUR). In 2015, Asia-Pacific generated more than half of the total global revenues, followed by North America (X%) and Western Europe (X%). Eastern Europe ranked fourth at a considerable distance, generating revenues of USD X billion (EUR X billion), followed by the Middle East and Africa with USD X billion (EUR X billion). Market value in South America was considerably lower, amounting to USD X billion (EUR X billion). We forecast global revenues to increase by X% p.a. between 2015 and 2023 (X% p.a. for EUR values) to approx. USD X billion (EUR X billion).

We forecast the most dynamic development of revenues in the next eight years to occur in Asia-Pacific. At an AAGR of X% p.a. (X% for EUR values), market value in this region will rise to approx. USD X billion (EUR X billion). World market share will increase to roughly X% accordingly. North America is expected to continue to register the second highest revenues in 2023. Recording revenues of about USD X billion (EUR X billion), this region will reach a market share of X%, followed by Western Europe that will generate USD X billion (EUR X billion) and hold X% of shares.



Graph: Global revenues from 2007 to 2023 in billion USD - split by regions

Chapter 1: Extensive market data from 2007 to 2023:

- Western Europe
- Eastern Europe
- North America
- South America
- Asia-Pacific
- Middle East & Africa

2.3.3 USA - Demand

2.3.3.1 Demand and Revenues

About X million tonnes of plastics were utilized in the construction industry in the USA in 2015. The USA are the second largest consumer of plastics in the construction industry worldwide, surpassed only by China. We forecast overall demand in the USA to rise to approx. X million tonnes in 2023. Compared to 2015, this constitutes an average increase of X% per year. Since the financial crisis, the development of the wage level in the USA was only low and the restricted issuance of mortgage loans as well as the rising prices for houses lead to the fact that especially younger citizens did not have a chance to acquire a homestead. In the meantime, there is a high potential for catching up in the construction of new residential units since many potential builders of houses had to postpone their plans due to the crisis. This means that the recovery of the economic situation also has positive effects on the construction industry. Compared to the previous year, investments in constructions have increased by X% in the first half of 2015. Especially the number public construction of residential units grew rapidly by X%. Also, the number of building permits and completed constructions increased in this period on the double-digit level. The number of completed residential units in the USA increased again significantly since 2012. Approx. X new residential units were completed in 2011. Until 2015, this value increased to approx. X. We expect another increase in 2016 to over X new residential units. Non-residential construction however profits currently from new office and hotel buildings. However, we expect a weaker growth dynamics in commercial constructions due to a foreseeable economic overheating in constructions of office buildings.

Civil engineering developed more weakly than building construction in the USA in 2015 and almost stagnated. We expect for 2016 and the following years that this segment will profit from the rising investments in the sector transport infrastructure. The segments water supply and sewage disposal will presumably also be treated predominantly in the upcoming years.

Chapter 2: Specific analyses and forecasts for 16 countries:

- Revenues (in US dollars & euros)
- Total demand (in tonnes)
- Demand split by types of plastics (in tonnes)
- Demand split by products
- Demand split by new construction, renovation, residential construction & non-residential construction



Graph: Demand for plastics

2.3.3.2 Demand Split by Products

Demand for plastics in the segment pipes amounted to X million tonnes in 2015, accounting for the major share of consumption in the USA. With the exception of the group of other products, which is likely to see demand fall, we forecast an increase of market volume for all applications until 2023.

in 1.000 tonnes	2007	2009	2011	2013	2015	2017p	2019p	2021p	2023p	2015 - 2023
Pipes	X	X	X	X	X	X	X	X	X	X% p.a.
Insulation Material	X	X	X	X	X	X	X	X	X	X% p.a.
Windows	X	X	X	X	X	X	X	X	X	X% p.a.
Other	X	X	X	X	X	X	X	X	X	X% p.a.
Total	X	X% p.a.								

Table: Demand for plastics in the construction industry in the USA from 2007 to 2023 – split by products

The sewage infrastructure of the USA is outdated at many places. There are estimates that almost USD 1 billion have to be invested in the old crumbling pipeline systems of the whole water management to grant full functionality for the upcoming two decades.

2.3.3.3 Demand Split by Construction Segments

in 1.000 tonnes	2007	2009	2011	2013	2015	2017p	2019p	2021p	2023p	2015 - 2023
New Construction	X	X	X	X	X	X	X	X	X	X% p.a.
Renovation	X	X	X	X	X	X	X	X	X	X% p.a.
Total	X	X% p.a.								
Residential Construction	X	X	X	X	X	X	X	X	X	X% p.a.
Non-Residential	X	X	X	X	X	X	X	X	X	X% p.a.
Total	X	X% p.a.								

Table: Demand for plastics in the construction industry in the USA from 2007 to 2023 – split by construction segments

With an amount of X million units in 2015, the construction segment new construction consumed more plastics than the segment renovation. Until 2023, we expect the segment new construction to increase its demand to X million tonnes while the segment renovation will presumably consume X million tonnes. In the USA, non-...

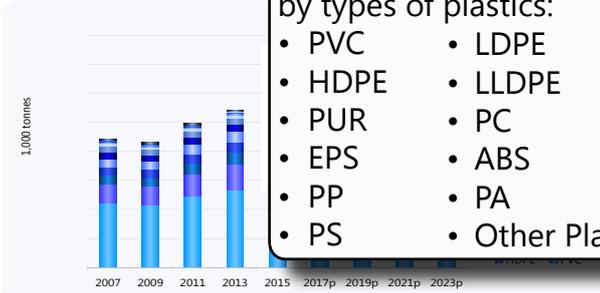
3 Types of Plastics

3.1 World

In 2015, X million plastics were used in the construction industry. By far, the most important plastic type is PVC; in 2015, about X million tonnes of this product were processed. The second highest market volume is followed by HDPE.

Chapter 3: Demand split by types of plastics:

- PVC
- LDPE
- HDPE
- LLDPE
- PUR
- PC
- EPS
- ABS
- PP
- PA
- PS
- Other Plastics



Graph: Global demand for plastics in the construction industry from 2007 to 2023 – split by plastic types

in million tonnes	2007	2009	2011	2013	2015	2017p	2019p	2021p	2023p	2015 - 2023
PVC	X	X	X	X	X	X	X	X	X	X% p.a.
HDPE	X	X	X	X	X	X	X	X	X	X% p.a.
PUR	X	X	X	X	X	X	X	X	X	X% p.a.
EPS	X	X	X	X	X	X	X	X	X	X% p.a.
PP	X	X	X	X	X	X	X	X	X	X% p.a.
PS	X	X	X	X	X	X	X	X	X	X% p.a.
LDPE	X	X	X	X	X	X	X	X	X	X% p.a.
LLDPE	X	X	X	X	X	X	X	X	X	X% p.a.
PC	X	X	X	X	X	X	X	X	X	X% p.a.
ABS	X	X	X	X	X	X	X	X	X	X% p.a.
PA	X	X	X	X	X	X	X	X	X	X% p.a.
Other	X	X	X	X	X	X	X	X	X	X% p.a.
Total	X	X% p.a.								

Table: Demand for plastics from 2007 to 2023 – split by applications

3.6.9 Asia-Pacific - Polycarbonate

In 2015, Asia-Pacific processed about X tonnes of PC in the construction industry, constituting an average increase of X% p.a. when compared to 2007. In this region, China processed the highest amount of PC in the construction industry, namely X tonnes. Japan followed at a large distance with X tonnes. We expect the highest relative increase for China. Consumption in this country will rise by X% p.a. until 2023.

Over the next eight years, total regional demand for PC in the construction industry will increase by an average of X% p.a. to approx. X tonnes.

in 1.000 tonnes	2007	2009	2011	2013	2015	2017p	2019p	2021p	2023p	2015 - 2023
China	X	X	X	X	X	X	X	X	X	X% p.a.
India	X	X	X	X	X	X	X	X	X	X% p.a.
Japan	X	X	X	X	X	X	X	X	X	X% p.a.
South Korea	X	X	X	X	X	X	X	X	X	X% p.a.
Other	X	X	X	X	X	X	X	X	X	X% p.a.
Total	X	X% p.a.								

Table: Demand for PC in the construction industry in Asia-Pacific from 2007 to 2023 – split by major countries

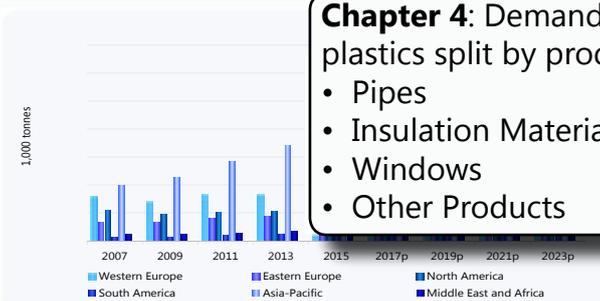
4.2. Insulation Materials

4.2.1 World

The challenge for the industry is to develop very efficient insulation products using the fewest material to improve thermal insulation of buildings. Insulation materials made of mineral wool meet their limit due to the continuing reduction of their thermal conductivity. In the past years, alternatives to the "conventional insulation materials" made from EPS and XPS, PUR and PIR, glass wool as well as rock wool have emerged. For the production of **vacuum insulation panels (VIP)**, a pressure-resistant core with open pores (oftentimes fumed silica, but also mineral wool or plastic foams) is surrounded by high-density film (e.g. aluminum composite film or metalized polymer film). A vacuum is generated and thus, the heat conductor is removed. VIP are very thin insulation materials and reach a thermal conductivity of less than 0,004 W·m⁻¹·K⁻¹. A very efficient insulation results by its use. Especially when there are little space and very ambitious goals (ultra-low-energy houses), its use is particularly suitable. However, building insulation has to be planned properly in advance since the size of the panels cannot be changed anymore on-site. The panels have to be customized for the space that needs insulation from the beginning which causes high prices.

Chapter 4: Demand for plastics split by products:

- Pipes
- Insulation Materials
- Windows
- Other Products



Graph: Global demand for plastics in the segment insulation material from 2007 to 2023 – split by regions

Major consumer of plastics is Asia-Pacific that processed X million tonnes in 2015, followed by Western Europe and North America. Asia-Pacific will continue to account for more than X% of the world's demand, registering a market volume of approx. X million tonnes in 2023. We expect West European producers to continue to exceed demand in North America. Asia-Pacific will register the strongest growth between 2015 and 2023, followed by South America.

4.2.2 Western Europe

Approx. X million tonnes of plastics were utilized for the production of insulation material in Western Europe in 2015. In 2015, main user in this industry was Germany. At a great distance, this was followed by Italy, the United Kingdom France, and Spain. Due to a strong growth rate of X% p.a., the United Kingdom will become the second largest consumer in this region in 2023. We expect total West European demand to amount to X million tonnes in 2023.

in 1.000 tonnes	2007	2009	2011	2013	2015	2017p	2019p	2021p	2023p	2015 - 2023
Germany	X	X	X	X	X	X	X	X	X	X% p.a.
France	X	X	X	X	X	X	X	X	X	X% p.a.
United Kingdom	X	X	X	X	X	X	X	X	X	X% p.a.
Italy	X	X	X	X	X	X	X	X	X	X% p.a.
Spain	X	X	X	X	X	X	X	X	X	X% p.a.
Other	X	X	X	X	X	X	X	X	X	X% p.a.
Total	X	X% p.a.								

Table: Demand for plastics in insulation material in Western Europe from 2007 to 2023 – split by major countries

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